Results: Baseline clinical characteristics of patients in both coronary slow flow phenomenon group and control group were almost similar. However, compared with control group, patients with coronary slow flow phenomenon were more likely males, with high levels of body mass index, weight and triglycerides, while the platelet lever was lower ($P<0.05$). The coronary anatomical parameters, like tortuosity index, coronary artery distal bifurcation was lower in control group than CSFP group ($P<0.05$). Multiple regression analysis showed that body mass index, tortuosity index of coronary artery and coronary artery distal bifurcation was positively related to coronary slow flow phenomenon. The conventional echocardiography parameters in two groups had not significantly different. The Vmax, Vmean, Pmax, Pmean and VTI of LAD in CSFP group were lower than control group ($P<0.05$). The left anterior descending artery CTFC with Vmax, Vmean, Pmax, Pmean was negative correlation in both group, and the left anterior descending artery CTFC was negatively correlated with VTI in the control group. The ROC curves show that the area under the curve that between 0.7 to 0.9 were coronary artery distal bifurcation, tortuosity index, and coronary artery flow related parameters.
Conclusions: The present study showed that there was direct correlation between coronary slow flow phenomenon and sex, body mass index, triglycerides, platelet, tortuosity index and coronary artery distal bifurcation. CFI could reflect the changes in coronary angiography, and they were meaningful on diagnosis of CSFP.

GW25-e1590

Evaluation of left ventricular myocardial function in coronary atherosclerosis patients with Type 2 Diabetes Mellitus by Speckle Tracking Echocardiography

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Objectives: To evaluation of left ventricular (LV) myocardial function in coronary atherosclerosis patients with Type 2 Diabetes Mellitus by Speckle Tracking Echocardiography (2D STE).
Methods: The study included 60 patients whose diagnosis of coronary atherosclerosis (<50%) and divided into DM group (30 patients with Type 2 Diabetes Mellitus) and non-DM group (30 patients without Type 2 Diabetes Mellitus), another selection for 30 cases of normal control group. LV regional longitudinal, circumferential and radial peak systolic strain (ε) were measured respectively.
Results: The EF were no difference between the 3 groups. However the peak systolic longitudinal strain (ε) in LV basal segments, middle segments and apical segments were significant lower in DM group than non-DM group and control group (P<0.05, respectively). The peak systolic circumferential and radial strain parameters showed no significant difference between the 3 groups.
Conclusions: The systolic longitudinal myocardial function of left ventricular evaluated by 2D STE has been reduced before the left ventricular global systolic function reduces in coronary atherosclerosis patients with Type 2 Diabetes Mellitus.

GW25-e0810

Intravenous ferumoxytol before mesenchymal stem cell harvest: a new method for tracking stem cell with MR imaging in cell therapy for myocardial infarction

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Objectives: To determine whether intravenous ferumoxytol before mesenchymal stem cells (MSCs) harvest can be used to effectively label stem cell in vivo and track MSCs with magnetic resonance imaging (MRI) in cell therapy for myocardial infarction.
Methods: Sprague-Dawley rats (6-8 weeks old) were injected with ferumoxytol 48 hours before extracting MSCs from bone marrow. Ferumoxytol in these MSCs was evaluated with fluorescence, confocal, and electron microscopy and compared with results of ex vivo-labeling procedures. The in vivo-labeled cells were transplanted in 30 cases of myocardial infarction and were evaluated with MRI up to 4 weeks after transplantation. T2 relaxation times of in vivo-labeled MSC transplants and unlabeled control transplants were compared by using t tests. MRI data were correlated with histopathologic findings.
Results: In vivo-labeled MSCs demonstrated significantly higher ferumoxytol uptake compared with ex vivo-labeled cells. With electron microscopy, ferumoxytol was localized in secondary lysosomes. In vivo-labeled cells demonstrated significant T2 shortening effects in vitro and in vivo when they were compared with unlabeled control cells (T2 in vivo, 14.5 vs 27.8 msec; P<0.05) and could be tracked in myocardial infarction for 4 weeks. Histologic examination confirmed the presence of iron in labeled transplants and myocardial infarction remodeling.
Conclusions: Intravenous ferumoxytol before stem cell harvest can be used to effectively label MSCs in vivo and track MSCs with MRI in cell therapy for myocardial infarction.

GW25-e0812

Myocardial computed tomography perfusion after Computed tomography angiography in patients with coronary stents: comparison with conventional coronary angiography

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Objectives: This study aimed to determine whether myocardial computed tomography perfusion (CTP) after computed tomography angiography (CTA) can improve diagnostic accuracy of coronary stents.
Methods: CTA and CTP were performed in 250 consecutive patients with stents before conventional coronary angiography. The reference standard for obstructive stenosis was ≥50%. If a coronary stent or vessel was nondiagnostic on CTA, adenosine stress CTP in the corresponding myocardial territory was read on CTA and CTP.
Results: Patients had an average of 1.5±2.2 coronary stents (1 to 8), with a diameter of 3.0±0.5 mm. Significantly more patients were nondiagnostic for stent assessment by CTA (25%; mainly due to metal artifacts [75%] or motion [23%]) versus CTP (2%; P<0.001; severe angina precluded CTP in 1 case). The per-patient diagnostic accuracy of CTA and CTP for stents (88%, 95% CI 75% to 94%) was significantly higher than that of CTA alone (72%, 95% CI 55% to 82%; P<0.001), mainly because nondiagnostic examinations were significantly reduced (P<0.001). In the analysis of any coronary artery disease, diagnostic accuracy and nondiagnostic rate were also significantly improved by the addition of CTP (P<0.001). CTA and CTP (8.0±3.2 mSv) had a significantly lower effective radiation dose than angiography (11.5±4.5 mSv; P=0.005). The area under the receiver-operating characteristic curve for CTA and CTP (0.85, 95% CI 0.71 to 0.95) was superior to that for CTA (0.68, 95% CI 0.57 to 0.82; P<0.001) in identifying patients requiring stent revascularization.
Conclusions: Myocardial CTP after coronary CTA can improve diagnostic accuracy of coronary stents compared with CTA alone.

GW25-e0814

Triple-fused reporter gene to monitor mesenchymal stem cells for the treatment of ischemic heart disease

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Objectives: The aim of this study was to explore a triple-fused reporter gene [TGF; herpes simplex virus type 1 thymidine kinase (HSV1-tk), enhanced green fluorescence protein (eGFP), and firefly luciferase (FLuc)] to monitor mesenchymal stem cells (MSCs) in acute myocardial infarction rat models.
Methods: Rat myocardial infarction was established by ligating the left anterior descending coronary artery. A recombinant adenovirus carrying TGF (Ad5-TGF) was constructed. After transfection with Ad5-TGF, 5×10^6 MSCs were transplanted into the anterior wall of the left ventricle (n = 16). Untransfected MSCs were transplanted as control group (n =10). Micro positron emission tomography/computed tomography (PET/CT), fluorescence and bioluminescence imaging were performed. Continuous images of the triple-fused reporter gene modalities were obtained at day 2, 3, 5 and 7 after transplantation and additional images were performed with bioluminescence imaging at day 14.
Results: High signals in the heart area were observed by micro-PET/CT, fluorescence and bioluminescence imaging in infarcted rats injected with Ad5-TGF-transfected MSCs. No signal was observed in control group. Semi-quantitative analysis showed the gradual decrease in signals in the three imaging modalities. Immunohistochemistry assays showed the location of the TGF protein expression was the same as the site of MSC specific marker expression, which suggested that TGF tracked the MSCs in situ.
Conclusions: A triple-fused reporter gene (HSV1-tk, eGFP, FLuc) could be used to monitor transplanted MSCs in acute myocardial infarction.

GW25-e1067

Extent of late gadolinium enhancement at right ventricular insertion points: independent predictor of left ventricular diastolic function in patients with hypertrophic cardiomyopathy

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Objectives: To examine the association between the extent of late gadolinium enhancement (LGE) at right ventricular insertion points (RVIP)and left ventricular (LV) functional parameters in patients with hypertrophic cardiomyopathy (HCM).
Methods: 61 HCM patients underwent echocardiography and cardiovascular MR within one week. Mitral annular velocities (E/E') were obtained from

echocardiography, and LV ejection fraction (EF), LV mass index, LV wall maximal thickness, and left atrial volume index (LAVI) from MR. LGE extent was quantified (presented as the proportion of total LV myocardial mass) according to location: % RVIP-LGE, %non-RVIP-LGE.
Results: Although LGE was commonly present in both apical (74%) and non-apical HCMs (84%) (P=0.163), RVIP-LGE was more frequent (86% vs 47%, P=0.002) in non-apical HCMs in which E/E' was significantly higher (19.23±8.40 vs 13.13±5.06, P=0.009). In addition, RVIP-LGE extent was correlated with lower LVEF (r=-0.42, P=0.001) and diastolic dysfunction (r=0.45, P<0.001 for E/E'; r=0.53, P<0.001 for LAVI). There was no correlation between non-RVIP-LGE extent and other parameters. Multiple linear regression analysis revealed RVIP-LGE extent as an independent predictor of E/E' (β=0.45, P<0.001) and LAVI in HCM patients (β=0.53, P<0.001).
Conclusions: LGE at RVIPs in HCM patients is independently related to diastolic dysfunction of LV. Non-RVIP-LGE did not show any association.

GW25-e1546

Assessment of ventricular arterial coupling relationship by stress and live three - dimensional echocardiography

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Objectives: Ventricular-arterial coupling was preliminarily studied by live three - dimensional echocardiography.
Methods: 45 healthy volunteers including man 22 and women 23, aged mean (25.5±2.8) years were studied. All subjects underwent a multistage symptom-limited supine graded exercise protocol on a variable load bicycle ergometer. The entire test was divided into three: pre-, peak, after exercise every 5 min. The Left ventricular chamber volumes were measured by live three - dimensional echocardiography. The myocardium under endomyocardial (EN-CS) and epicardial (EP-CS) circumferential strain at the levels of basement and cardiac apex was automatically calculated respectively. Arterial elastance (Ea), left ventricular end-systolic elastance (Ees) and ventricular-arterial coupling index (VVI) were calculated. The myocardial strain indexes for VVI indicator were screened by multiple linear regression analysis and a mathematical model was developed by regression equation.
Results: Different stages of trial: (1) EN-CS at the levels of basement showed a increasing trend after decreasing (P<0.01) (end of ejection time: -20.34±4.38, -15.31±10.85 and -15.87±7.54; end of relaxation time: -19.37±8.21, -12.17±9.71 and -16.34±9.37). (2) EP-CS at the levels of basement showed a increasing trend after decreasing (P<0.01) (end of ejection time: -9.32±3.41, -6.03±4.99 and -6.99±3.49; end of relaxation time: -8.40±4.63, -5.04±3.90 and -7.20±3.41). (3) Ees and Ea showed an increasing trend after decreasing, but the ratios did not change significantly.
Conclusions: Exercise led to synchronously increasing in ventricular and arterial stiffness, and ventriculoarterial coupling was maintained. Live three - dimensional echocardiography could be used to evaluate the ventricular - vascular coupling.

GW25-e1625

Measurement of myocardial perfusion reserve index at 3.0T MR system compared with X-ray coronary angiography

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Objectives: To detect myocardial ischemia caused by coronary artery stenosis using adenosine stress myocardial perfusion magnetic resonance imaging at 3.0T. The relationship between the myocardial perfusion reserve index (MPRi) and coronary artery stenosis was explored.
Methods: 20 patients with suspected coronary artery disease (CAD) were examined using 3.0T cardiac magnetic resonance (CMR) before invasive coronary artery angiography. The CMR study included stress and rest first pass myocardial perfusion, and delayed enhancement scans. All CMR images were delivered to a medical image workstation for visual assessment by 2 blinded observers. A semiquantitive analysis was used by measuring upslope of time-intensity curve in each myocardial segment. The myocardial perfusion reserve index (MPRi) was defined as the ratio of stress to rest normalized upslope. The MPRi values were compared with X-ray coronary angiography.
Results: All 20 patients completed the MRI studies safely. A diameter stenosis ≥50% in any main or branches of coronary arteries on invasive angiography was defined as significant stenosis. In semiquantitive analysis, MPRi (whole layer of myocardial wall as ROI) and MPR_{inner} (inner layer of myocardial wall as ROI) values from 299 segments (299/320, 93.4%) were obtained. There was a significant difference of MPRi values between stenosis group and no stenosis group (Z=-6.552, P<0.001). When the smallest value in each vascular territory was put into statistic processing, a negative correlation between MPR_{inner} value and severity of stenosis was found (r=-0.644, P<0.001). In visual analysis, the sensitivity and specificity of CMR for diagnosis of CAD were 84.6% and 85.7% on patient level, 79.2% and 79.8% on per-vessel basis. In the receiver operating characteristic (ROC) curve analysis, when the MPR_{inner} cut off value of 1.29 was selected by maximum diagnostic effect, the sensitivity and specificity were 87.5% and 66.7% respectively. Compared area under the curves of ROC, there were no significant differences between semiquantitive and visual analysis method (0.848 vs 0.785, P>0.05).
Conclusions: 3.0T MR perfusion imaging and semiquantitive analysis can detect myocardial ischemia caused by hemodynamic significant coronary artery stenosis.

GW25-e2301

Using three-dimensional speckle-tracking echocardiography to assess the left ventricular function of varying degrees aortic stenosis

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Objectives: Aortic stenosis (AS) was a major cause of sudden cardiac death, early detection of left ventricle (LV) dysfunction is essential for management of patients with aortic stenosis. The aim of this study was to compare the left ventricle function in varying degrees AS using three-dimensional speckle-tracking echocardiography.
Methods: We prospectively enrolled 44 AS patients with aortic flow velocity >3.0m/s, mean valve pressure gradient >20mmHg, 54 controls were enrolled for compare the difference. Further AS patients were divided into different groups according to aortic stenosis gradient and symptoms (angina, exercise intolerance). AS gradient subgroup had 18 moderate AS patients (mean gradient <40mmHg) and 26 severe AS patients (mean gradient ≥40mmHg). Symptoms subgroup included 23 asymptomatic patients and 21 symptomatic patients. All patients underwent two-dimensional echocardiography and three-dimensional speckle-tracking echocardiography.
Results: Aortic stenosis patients had lower 2D LVEF, three-dimensional global radial strain (GRS), global circumferential strain (GCS), global longitudinal strain (GLS) and area tracking than control group (P<0.001, P=0.001, P=0.042, P<0.001, P=0.004, respectively). Three-dimensional GCS and area tracking had negative correlation with LVEF (r=-0.72, P<0.0001; r=-0.72, P<0.0001, respectively). AS gradient Subgroup analysis demonstrated that GRS and three-dimensional strain was lower in severe AS subgroup (P=0.042, P=0.038, respectively); peak time of standard deviation in twelve heart segments (medium and basal part of heart) for 3D Displacement was significant larger in severe subgroup (P=0.02). 3D echocardiograph parameters in symptoms subgroup analysis showed no significant difference between symptomatic and asymptomatic group.
Conclusions: Our study indicates GCS and Area tracking are the most subtle markers to detect LV systolic dysfunction of aorta stenos. Radial and circumferential myocardium motion of the left ventricle impaired in AS patients, and the damage extent increased with AS severity.

GW25-e4220

Comparison of two methods for evaluating human carotid artery elasticity: Possible detection of early atherosclerosis In subjects with dyslipidemia

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Objectives: Dyslipidemia is closely associated with the development of atherosclerosis, and is reportedly one of the most important modifiable risk factors of cardiovascular disease (CVD). Both ultrasound radiofrequency (RF)-data technique and vessel texture matching method (VTMM) are noninvasive vessel tracking technique, the former is capable to calculate artery elastic parameters instantly by means of ultrasound RF signal, and the latter can measure artery wall elasticity modulus by off-line analysis of B-mode ultrasound dynamic images during cardiac cycle. The aim of the present study was to compare the values of carotid artery elasticity in the same subjects with dyslipidemia by the two methods, in order to determine whether their measures can be conveniently and accurately applied to reflect early atherosclerosis.
Methods: Eighty six subjects with dyslipidemia who met the Adult Treatment Panel III criteria for borderline dyslipidemia and without clinical CVD were enrolled in the study. Left common carotid artery (CCA) of all subjects were assessed in the same session, by the same operator and analysed both by the ultrasound RF-data technique and VTMM. Carotid intima-media thickness (IMT), distensibility coefficient (DC), compliance coefficient (CC), α stiffness (α), β stiffness (β) and single point pulse wave velocity (PWV) were measured automatically by the former method, and elasticity modulus (E) were calculated by the latter one.
Results: IMT negatively correlated with CC (P>0.05) and DC (P<0.05), positively correlated with α, β, PWV and E (P<0.05), and the correlation coefficient were -0.086, -0.342, 0.321, 0.322, 0.394 and 0.518, separately. Grouping by the presence or absece of other atherosclerotic risk factors in subjects with IMT <1.0mm (n=81), there were significant differences only in PWV and E (P<0.05), no difference was observed in CC, DC, α and β (P>0.05). And furthermore, the relationships between